Mecheleciv

VOLUME 26 MARCH–1968 No. 4

THE GEORGE WASHINGTON UNIVERSITY

MARCH 1968

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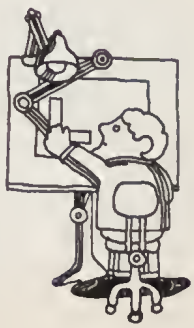

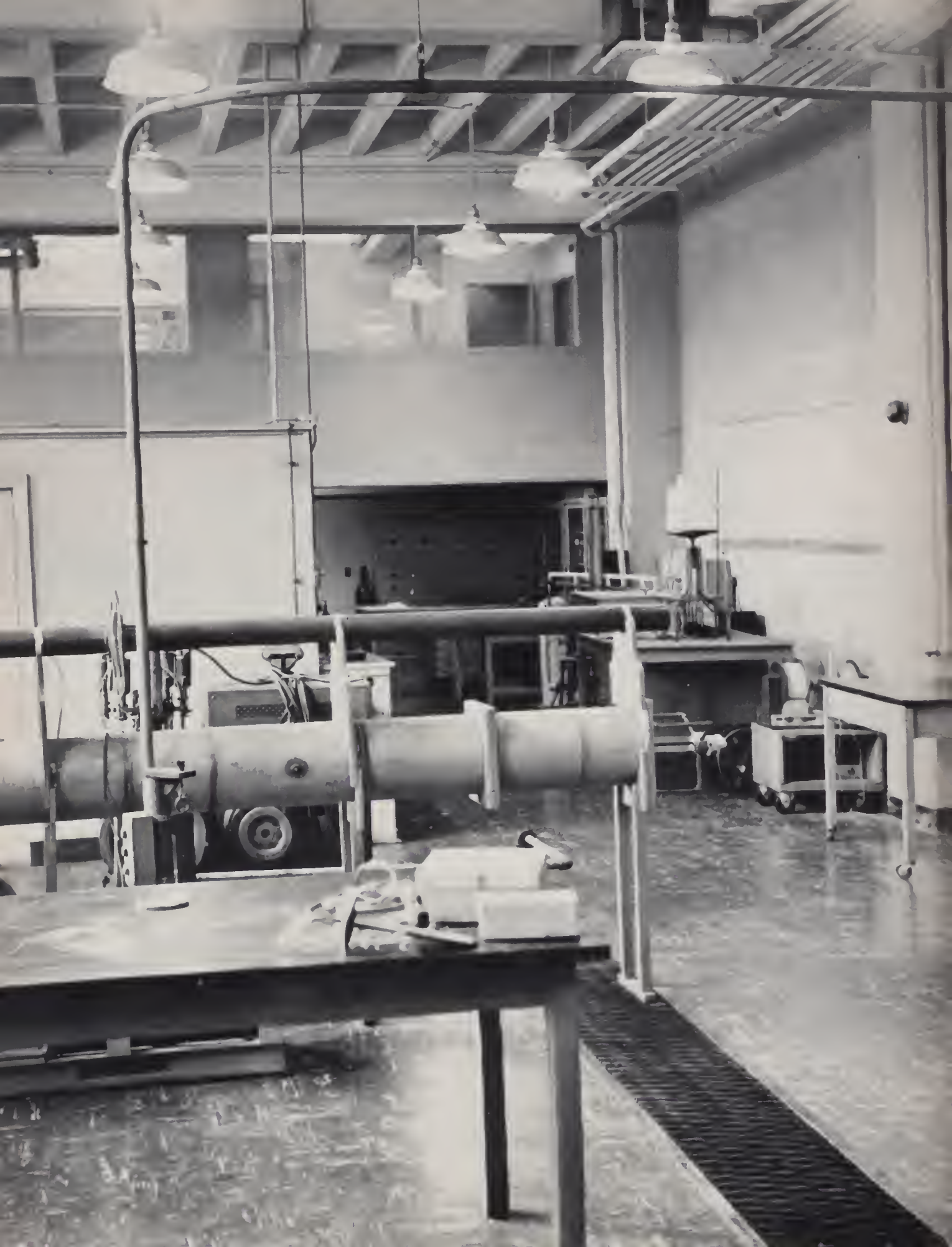

MECHELECIV

LABORATORIES IN REVIEW

The argument continues to rage among engineering educators concerning the role of laboratory experimentation. One school of thought claims that there is not enough time, nor need, in the undergraduate curriculum to offer laboratory courses relating to the theoretical classes. In opposition is the theory held by many prominent engineering educators, that familiarity with the practical aspects of engineering is the primary motivating factor toward higher levels of achievement in the classroom. The American Society for Engineering Education, in the June, 1967, issue of their journal, provided statistical evidence supporting this thesis.

At George Washington University, in the School of Engineering & Applied Science, laboratory experience for the Mechanical & Civil Engineering students is given a minor role. Two years ago, the School of Engineering & Applied Science was reevaluated by the Engineering Council for Professional Development. The ECPD is responsible for granting national accreditation to individual Universities. The reevaluation of two years ago, resulted in probationary accreditation for the S.E.A.S. The primary reason for this probation was the poor condition of the labs, and the lack of lab courses by the students in the engineering school.

Why were our labs criticized so severely by the evaluation committee? In our opinion, it is the fault of everyone involved; the students, the faculty and the administration.

Most of the students are not willing to make good use of the available lab time. The students either come to class late, wander off to get something to eat, or do homework for some other course. Very few put the required 250 minutes a week to good use, nor are they willing to spend more than the minimum required time. Thus, the labs are vacant most of the time. And when the students are in the labs, they show a deplorable lack of responsibility for the equipment; leaving tools and equipment where last used, and failing to clean up when finished. The students are not entirely to blame for these criticisms; rather it is simply a reflection on the organization of the labs.

The faculty could help change the role of the labs by performing small demonstrations in class to clarify theory; this would also make students aware of existing equipment. But the faculty does not want to do this. They do not want to encourage graduate students to coordinate lab work with their required theses, nor do they encourage and direct undergraduate students to present research projects.

If there is no one on the faculty who has an interest in maintaining, organizing, and running the labs, then it is the responsibility of the administration to get some one for the job. A faculty with greatly diversified interests is needed. This year the administration's answer to the need for a faculty member in the labs was Professor Douglas Jones. He was assigned to the labs with little support. Since he is leaving this year, a new professor will be needed for next fall. The administration has known about this need since last August. It will take more than a month for anyone to prepare the labs, and familiarize himself with the existing equipment. As it stands, the new lab professor will not even be able to find which key fits which lock.

We understand an associate professor is to be in the labs full time next year, but, until one is found, someone should become familiar with the labs to brief the new man in September, when and if he is found. If a professor is not available, then a graduate student would be better than nothing, but, it will take a graduate student longer to become familiar with the equipment.

The relation of Mechanical and Civil Engineering to the rest of the Engineering School is certainly the responsibility of the Administration, and if the administration thinks that a large room in the Mechanical Engineering lab should be used to store expensive junk belonging to the Electrical Engineering Department, so be it. But this is not making the best use of the small space available. One large corner of the room is taken up by Nickle-Cadmium batteries. We were told that these batteries were used for a DC power source on the fourth floor. We asked three people, associated with the Electrical Engineering department, about a DC power source, and were informed that there is no battery powered DC power source.

We feel the cleaning of the labs by the janitors is also a responsibility of the administration. The plaster left on the floor of the materials lab, in October, was swept up just before Engineers' Week by students organized by Professor Jones. The trash can in the same lab had not been emptied since September. The trash can sits not ten feet from the favorite sleeping spot of the day time janitor. Having had a camera on any one of a number of occasions, we could provide proof of this lack of supervision by the administration.

The students themselves would probably be more inclined to clean the labs themselves, if cleaning utensils were available. We are sure that there has been cleaning equipment in the past, but since the policy was to leave the labs unlocked, equipment has been stolen. This includes tools and lab equipment as well as the cleaning equipment.

The small amount of money available each year was then used to replenish the stolen tools. It is nice to work with new tools, but it would be nicer to keep them for more than one year, and get new equipment.

By this editorial we are not criticizing the new administration, but simply pointing out to every echelon, that a problem exists. In our opinion, laboratory experience is an integral, and important part of engineering education. The GWU School of Engineering would be better if the students, faculty and administration made a combined effort to improve the laboratory facilities.

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Tompkins Hall, School of Engineering and Applied Science, during Open House.

FRONTISPIECE

Part of the Mechanical Engineering Laboratory in the basement of Tompkins Hall.

Published at the George Washington University by direction of the Engineers' Council. Published six times during the school year in October, November, December, March, April, and May. Second class postage paid at Washington, D. C. Address communications to Mechelecîv Magazine, Davis-Hodgkins House, George Washington University, Washington, D. C. 20006, or telephone 676-6726.

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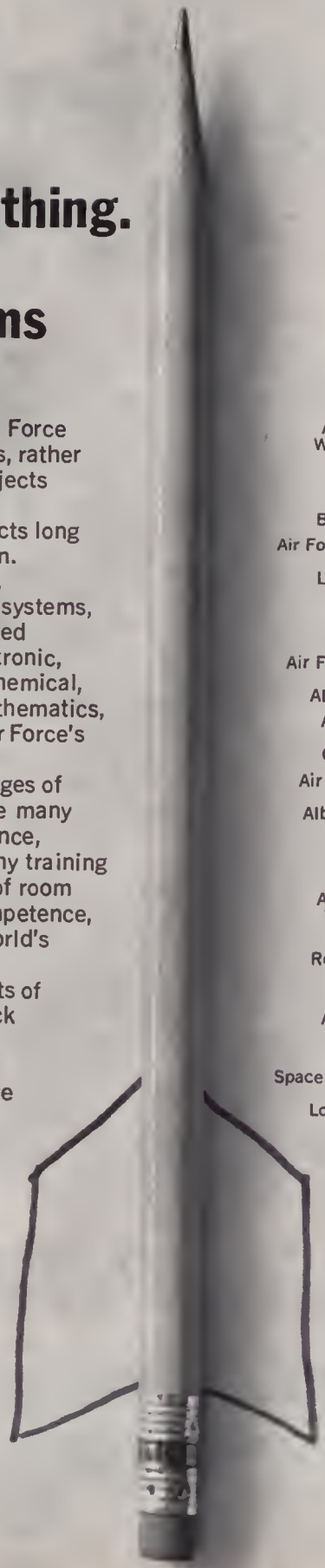

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LETTERS TO THE EDITOR

To the Editor:

I am greatly disturbed by the editorial "Passivism" in the November Issue of Mecheleciv. One thing engineers should remember at all times is that their basic stock-in-trade is the application of scientific principles to the solution of problems. The use of analogies is justified only after a thorough analysis has demonstrated the validity of the analogy, – and even then great care must be exercised lest some important factors have been overlooked.

The analogy between the war in Viet Nam and World War II, as made in the editorial, is based on two observations. 1. Before December 1941, a vociferous group of well-meaning citizens opposed America's entry into World War II against Germany. 2. Germany used all available means to support this movement. You state: "It is evident that Nazi Germany desired to keep America out of the war *until it had completed the conquest of England and Russia and could turn its undivided attention to this country.*" (The first part of the quoted sentence is true, the underlined part is false, i.e. this is certainly not evident. What Germany's intentions were at that time can be determined only through thorough historical research. It might well be argued that the German national interest required finding a modus vivendi with the U. S. after the conquest of Europe and Russia, rather than an armed conflict. At any rate, the underlined statement is a typical example of non-scientific thinking and the use of emotional extrapolations, not supported by factual evidence, to support a preconceived point.)

The analogy, based entirely on these two points, now leads you to the following two statements, both reasonably correct (though one might argue whether there exists, in fact, such a thing as "the communist cause in general" and "the general communist movement", and if it does, whether its interests necessarily always coincide with those of North Viet Nam): 1. It is beneficial to North Viet Nam in particular and the communist cause in general for the U. S. to get out of Viet Nam; and 2. North Viet Nam and the general communist movement are very probably backing the "get out of Viet Nam" activities. From that you draw the conclusion that "those two points alone would seem to be sufficient justification for our presence there." Such a non-sequitur is a blemish on the entire engineering profession.

The implied reasoning is (1): What is beneficial for North Viet Nam is eo ipso against our national interest; and (2): When North Viet Nam "backs" (whatever that may imply for a country that has neither formal representation nor informal emissaries of any kind here) a movement here, we are justified to use military force to destroy her national wealth and kill her citizens. Whatever the merits of our actions in Viet Nam, the reasoning advanced in the editorial is evidently absurd.

Let us carry the analogy a little farther. What were the factors that led us to the conclusion in World War II that our national interest demanded the defeat of Germany? They had nothing to do with the fact that Germany placed full-page advertisements in American newspapers advocating "Keep America out of the War". They were, in fact, the realization that (1) an all-powerful Germany could force a modus vivendi on us that would seriously restrict our trade activities and thus lower our standard of living; and (2) a victorious Germany would mean loss of political freedom for millions and untold suffering and, in many cases, death for an additional multitude of people. These must be the important factors of the analogy, rather than the incidental ones quoted.

Does the analogy stand up here? Would a North Vietnamese victory (i.e. re-unification of the two Viet Nams under Ho Chi Min) really constitute an economic threat to the U. S.? (And if it is argued that it is really China we are concerned with, what evidence is there that a North Vietnamese victory is equivalent to a Chinese victory in view of the traditional fear by Viet Nam of Chinese domination and the absence of Chinese soldiers in Viet Nam?) Could a victorious North Viet Nam force the U. S. into a modus vivendi that would lead to a reduced standard of living here? And finally, while a North Vietnamese victory undoubtedly would lead to considerable suffering (and, in many cases, death) among those South Vietnamese who have opposed the rule of Ho Chi Min, how much suffering and how many deaths has our presence there caused, and is continuing to cause? What evidence do you have (who seem to consider yourself "ill informed, at best") that makes you attach a much greater weight to the suffering of our supporters in South Viet Nam (whom a large fraction of the South Vietnamese people apparently consider traitors and exploiters, and who certainly include all those whose economic interests are threatened by a North Vietnamese victory) than to the suffering of those people who, misguided or otherwise, believe they are

Continued on page 30

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"... a great SEAS."

Dean Harold Liebowitz

On February 5, 1968, Dr. Harold Liebowitz assumed the position of the Dean of the School of Engineering and Applied Science. He comes to SEAS after serving not only the academic world but also the engineering profession. His twenty-two years of professional experience encompasses such areas as teaching, research, engineering and design, supervision of scientific research and engineering programs, and administration and technical direction of educational programs, among others.

Dr. Liebowitz was educated at the Polytechnic Institute of Brooklyn receiving his Bachelor of Science Degree in 1944, his Master's in 1946, and his Ph.D. in 1948. During this time he was awarded a fellowship, research assistantship, and research associateships. It was during this time that Dr. Liebowitz began his career as a prolific author of outstanding scientific literature. During his career, Dr. Liebowitz has co-authored about 50 papers and books, winning for himself the position as one of the foremost experts in the realm of fracture mechanics. At present Dr. Liebowitz is editing an eight-volume Treatise on Fracture which will be published by Academic Press and which promises to be the "bible" of fracture mechanics, of which five volumes have been submitted to the publisher.

Dr. Liebowitz began his engineering career with the Office of Naval Research as an Aeronautical Engineer in 1948. Between 1948 and 1959, Dr. Liebowitz progressed through the ranks to become the Head of the Structural Mechanics Branch and Engineering Advisor of O.N.R. During this period he worked in the fields of engineering, research, and consulting. In 1960 Dr. Liebowitz assumed the position as a Visiting Professor of Aeronautical Engineering and acted as Assistant Dean of the Graduate School and Executive Director of the Engineering Experiment Station at the University of Colorado. From 1961 to 1968, Dr. Liebowitz enjoyed a diverse life as a Research Professor at Catholic University, Consulting Engineer in industry and Engineering Advisor for the Office of Naval Research, Head of the Structural Mechanics Branch at O.N.R., and on special assignment on research and development at the Office of the Secretary of Defense.

Some of the highlights of Dr. Liebowitz's career will serve to show that our new Dean is a man of action and not just a man of words. He has proven the feasibility of deep ocean submergence for combatant vehicles including a design of the first sandwich deep submergence hull providing appropriate buoyancy; directed the program on new reinforced solid propellants which has been recommended for follow-on Advanced Sea Based Deterrent Polaris Missiles; participated in the atomic tests on Project WIGWAM which provided data on the vulnerability of submarines; and directed the first National Science Foundation Study on undergraduate and graduate curricula on solid mechanics providing guidelines aimed at developing an integrated curriculum in structural mechanics with more emphasis on

solid state physics, metallurgy, applied mathematics, and engineering science. (It was this study that lead to the book *Curricula in Solid Mechanics,* edited by Liebowitz & Allen.) Dr. Liebowitz was not content just to work in the present but also looked to the future as he was one of the first to recognize the need for lighter weight submarine structures work and lead the way to the design of high performance vehicles as required in ocean engineering; for engineering programs in high temperature vehicles, for engineering work on high strain-rate-effects of materials leading to the initiation of programs in dynamic photoelasticity and mechanics of materials, and for engineering modeling techniques for thermo-inelastic flight structures. He was also instrumental in recognizing the need for high speed wind tunnels to be used for testing high temperature structures, responsible for supporting one of the largest engineering mechanics programs, ONR Dean of Trident Scholars Program at the United States Naval Academy, and in general was successful in maintaining and directing an engineering program when science research was more fashionable.

Dr. Liebowitz's work for society and mankind in general has been rewarded in many ways. A few of them are the ONR Superior Accomplishment Award for work in solid propellant research, the ONR Outstanding Award in recognition for outstanding work in engineering, appointed member of NASA Technical Space Vehicles Committee, twice received the Navy's Superior Civilian Service Award, Who's Who in Space, Leaders of American Men in Science, U. S. Member of NATO's AGARD Panel on Structures and Materials. He is the co-editor and founder of a new international technical journal and also serves as a reviewer for the International Journal of Structures and Solids, the International Journal of Engineering Sciences, the Journal of American Institute of Aeronautics and Astronautics, the National Science Foundation Equipment Grants, Undergraduate and Graduate Grants and Research Grants, John Wiley Publishers, Pergamon Press, and Academic Press. His membership includes AAAS (Fellow), AIAA (Assoc. Fellow), ASME, ASEE, Tau Beta Pi, and others.

One would be hard put not to be at least slightly impressed by the previous abridged list of credentials. But previous work does not always guarantee that future work will be as outstanding. However, after personally speaking to Dr. Liebowitz concerning the S.E.A.S., I feel certain that S.E.A.S. has found a man who will lead us to the top of the academic world.

Questioned about what he sees in the future for the SEAS, Dr. Liebowitz spoke in general terms about the educational process and its relation to the student. First, he said that an educational institution must have a well thought-out outline of its goals. This is one of his first and major objectives, i.e. to decide upon the future direction of the school. Dr. Liebowitz realizes that one man cannot make this decision and has thus already started the necessary machinery in motion. Once the goals of the school have been put forth, then, and only then, can the school begin its arduous journey for academic excellence.

In order to achieve academic excellence in the School of Engineering and Applied Science, Dr. Liebowitz feels that SEAS can not be in isolation from the rest of the University. It is not only enough to rely upon the physical and academic assets of Tompkins Hall but it is also important to utilize the many assets of the rest of the University. The strength of SEAS will depend heavily upon the amount of joint cooperation and implementation of the interdisciplinary programs requiring the aid of all the schools in the University. In regard to this problem, Dean Liebowitz has already met with some of the Deans of other schools, the administrative departments of the University, the admissions office, and the registrars office. From now on, the School of Engineering and Applied Science will be considered more than ever in the plans of the University, and we will have an active and dynamic leader fighting for the University's welfare which of course greatly includes the School of Engineering and Applied Sciences.

In regard to the academic lift of the student of engineering, Dean Liebowitz believes that it is necessary to have balance between the fundamental scientific principles of engineering and the technological aspects resulting from their implementation. After all, engineering is the application of scientific principles to the sociological and technical problems of the day. But realizing that modern engineering is becoming more sophisticated, and realizing that engineering is becoming a generator of science as well as a user of science, Dr. Liebowitz sees a greater role of research in both graduate work and undergraduate study. He also sees a greater interaction of ideas and work between the graduate and the undergraduate, thus creating an atmosphere in which learning, creativity, and evolution will flourish.

These are but a few of the changes that we may expect as Dr. Harold Liebowitz leads the School of Engineering and Applied Science to its near future role as a "little M.I.T." and then to a "great S.E.A.S."

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"Take my own situation, for example. I act as a kind of entrepreneur for my department. I decide if we should bid on certain government contracts for my group and then develop the proposal strategy. Of course, upper management reviews my decisions, but to a great extent I run my own show.

"Another thing that makes this like a small company is the close relationship with your boss. You're almost always hired by the manager you're going to report to. And you work for him on your own or in a small team. It's part of his job to know your long term goals and help you reach them.

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Gene's comments cover only a small part of the IBM story. For more facts, visit your campus placement office. Or send an outline of your career interests and educational background to P. J. Koslow, IBM Corp., Dept. E, 425 Park Ave., N. Y., N. Y. 10022. We're an equal opportunity employer.

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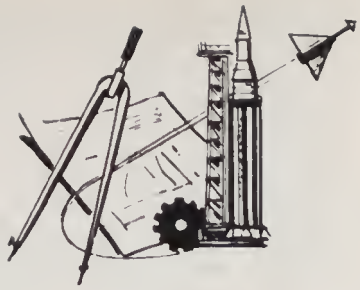

Edited by James Wong

MOVEMENT OF STADIUM SECTIONS WITH AIR FLOTATION

Behlen Manufacturing Company of Columbus, Nebraska recently announced the development of a steel stadium that floats on a cushion of air. With the use of air flotation, relatively little effort is required to reposition large sections of seating in any desired configuration. A completed prototype measures 24' wide x 36' deep and weighs twelve tons. In this prototype, urethane rubber "pillows", developed by General Motors Corporation, are secured to steel pads at the base of four supporting columns. The stadium "floats" when the pads are inflated with two to five pounds of air pressure per square inch and a thin layer of air escapes from beneath. The volume of escaping air is so small that it is difficult to detect and no dust problem exists. Air pressure would be supplied by a portable turbine compressor. When movement is required, approximately 50 to 100 pounds of lateral push per flotation pad is necessary. In actual use, a section many times the size of the prototype would be maneuvered by rubber-wheeled tractors to provide the desired seating arrangement.

Floating 12-Ton Stadium Section

Visual Spectrum Analyzing System

NEW SPECTRUM ANALYZING SYSTEM

Oscilloscope spectrum presentation, one octave at a time, of the 14 kHz to 1000MHz range is now possible with full electronically tracked RF amplification and pre-selection through use of the new Calibrated Spectrum Analyzing Receiver Model CSR-200 developed by Electro-Metrics Corporation, Amsterdam, New York, a subsidiary of Fairchild Camera and Instrument Corporation. This new tool for RFI/EMC testing, field strength measurements, spectrum surveillance and other special applications, as well as for use in basic design engineering, makes possible for the first time visual quick-look surveys of octave frequency ranges with integral pre-selection during manual or automated testing, as well as narrowband, close scrutiny of specific signals. The Model CSR-200 combines the new Interference Analyzer Model EMC-25 which is the first commercially available varactor-tuned, programmable, calibrated receiver, designed for RFI/EMC testing and general use, and the Spectrum Display Module Model SPD-125, which is a Fairchild oscilloscope with time-base plug-in and a specially designed combination Spectrum Analyzer Plug-in Model PP-125.

Automatic Synchronizer for Turbine-Generator

AUTOMATIC SYNCHRONIZER SYSTEM FOR TURBINE-GENERATORS

A new solid-state automatic synchronizing system (Type XASV) for start-up control of turbine-generators provides the electric utility industry with long-life, compact, and reliable control equipment that requires negligible maintenance has been developed by Westinghouse Electric Corporation. Operation of the synchronizing system is based upon the voltage, frequency, and phase relationship of the operating and incoming voltages. Voltage matching and speed matching, as well as synchronizing, are included in the system. Improved circuitry saves time in synchronizing and its modular construction permits various combinations of functions in a single coordinated package. The type XASV automatic synchronizer is available from the Westinghouse Switchgear Division as a single unit and operates on 120 volts, ac.

LIGHT-AMPLIFYING PICTURE TUBE

A new "see-in-the-dark" television camera system with an ultra-sensitive camera tube has been turned on the heavens. The system records dim far-away objects in the universe with a sensitivity at least ten times that of the photographic plates usually used. The system's tube, called an SEC (Secondary Electron Conduction) camera tube, does this by converting the invisible light into an electrical signal and amplifying it hundreds of times before changing it back into a visible image. In addition, it can be used to build up even weaker light signals into bright images by accumulating the light collected over a period of time before releasing the signal. This process, called integration, is the mode of operation used in the astronomical research at Allegheny Observatory of the University of Pittsburgh where the television camera is installed on the observatory's 30-inch refracting telescope. To orient the telescope, the camera is operated at the normal scanning rate of 30 frames per second. To observe faint objects, the system is switched to the "integrate" mode for periods of from 10 to 20 seconds. After the desired integration time, the strengthened image was read out within one or two frames (1/30 to 1/15 second) as a bright transient picture on the television screen. During the period of bright display, a photograph of the object is made from the television screen. The tube was developed by the Westinghouse Electronic Tube Division and obtains its ability to amplify light from release of electrons within a thin target film when the film is struck by the incident radiation. The target film has high electrical resistance, permitting signals to be built up and stored on its surface for hours without leaking away.

BANDAGE FOR THE CHESAPEAKE & OHIO CANAL

A giant plastic bandage 44 feet wide and 2,000 feet long has bound the wounds that turned the C & O Canal into a waterless muck. Leaks in the ancient canal bed that had been tear-drop trickles became a powerful current that swept 100,000 cubic yards of material, including a 100-foot section of the towpath and canal bank, into the Potomac River. To mend the wound, the canal bed was cleaned out and heavy duty polyvinyl chloride plastic sheeting manufactured by the Goodyear Tire & Rubber Company was placed on top of two feet of fresh, neatly packed clay. Strips of vinyl 400 feet long were joined together using a technique developed by Staff Industries of Upper Montclair, N. J., and Detroit, Mich., pioneer in developing plastic linings for seepage protection, waterproofing and protective covers. Another foot of clay then was placed on top of the liner, to protect it against turtles, muskrats and crayfish.

The vinyl, 35 mils thick, is so tough that a ½-inch steel reinforcing rod dropped from three feet does not puncture it.

Plastic Liner for the C & O Canal

ELECTROMAGNETIC LEVITATION SYSTEMS

A unique electromagnetic levitation system developed by two Westinghouse Research Laboratories scientists is now speeding the precise analysis of gases locked inside metals. These gases determine many of the physical properties of metals used in welding and in high-temperature or high-vacuum environments.

Continued on page 31

IT ONLY TAKES A YEAR TO KNOW IF YOU CAN MAKE IT WITH THE BELL SYSTEM

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and Associated Companies

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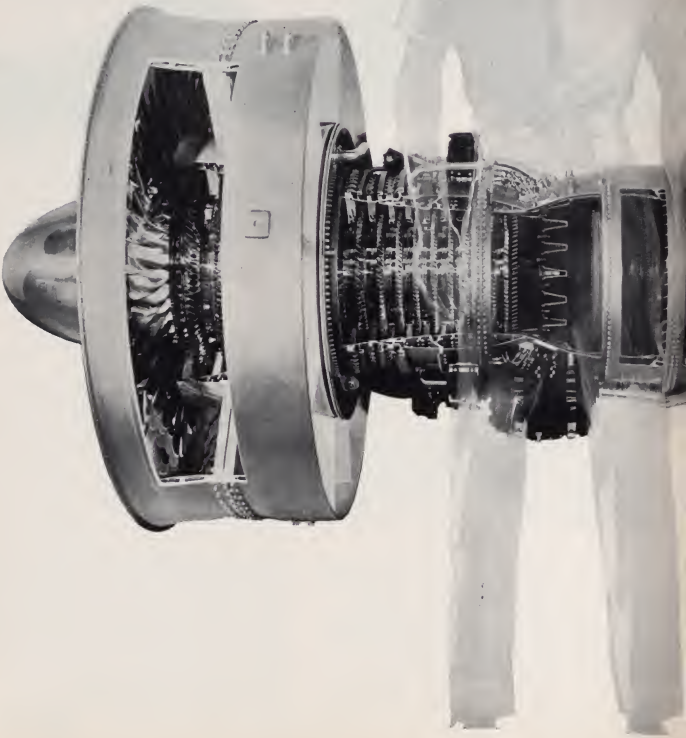

...they're right. And wrong.

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We select our engineers and scientists carefully. Motivate them well. Give them the equipment and facilities only a leader can provide. Offer them company-paid, graduate-education opportunities. Encourage them to push into fields that have not been explored before. Keep them reaching for a little bit more responsibility than they can manage. Reward them well when they *do* manage it.

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MECH

MISS

Susan Schlossman

There has always been a gap between the engineers' culture and the culture of the liberal arts education. Susan Schlossman, as an Art History major, represents the education, ideas, and concepts of the University, east of twenty-second street, while the engineering education is symbolized by the numbers and formulas. Usually efforts to get these two cultures together fail, but the method illustrated here seems to be shaping up pretty well.

It is too bad that Lisegue couldn't figure into the picture. He had the right idea but the wrong direction.

GOALS OF ENGINEERING

by Ric Barton

For the last five years, the American Society for Engineering Education (ASEE) has made a thorough study of the goals of engineering education. They have accumulated a large quantity of data from different schools, engineering firms, and practicing engineers and have evaluated every facet of the pre-professional training of engineers. The Goals Committee of the ASEE consisted of approximately thirty educators and engineers from major corporations. The committee has turned in three major reports and several articles during the course of the study and this article is a summary of the final report of the ASEE.

The basic aim of the committee was to indicate what direction engineering education must take to meet the demands of the future. The report states that, "It is neither a detailed evaluation of present practices nor a consensus of current suggestions for improvement, but an effort to delineate significant trends in engineering education and to relate these trends to the future needs of practicing engineers."

Engineering education lends itself to constant self-evaluation. In the past fifty years no less than seven major studies have been made in an attempt to tune the education program to the demands of engineering practice. This constant self-evaluation has led to a very stable engineering program. Employers are quite satisfied with the caliber of engineers being turned out by the institutions around the country. There have been numerous suggestions for improvement in certain areas, but none of these suggestions require any radical changes in the education program.

The challenge that faces the educators today is the task of altering the education practices in use. They must attempt to turn out engineers prepared to meet the requirements of the day and of the future. Certainly an engineer, educated in the thirties, would be lacking knowledge of the recent developments that are of paramount importance to present engineering work. It follows, obviously, that engineering programs, in operation presently, will have to be altered continuously to keep pace with technological development. Therefore, the educators must be able to reevaluate the present programs and alter them accordingly in order to meet the demands of the future.

In the majority of the evaluations of engineering education, two main trends have been observed. They are basically general trends and are apparent in most of the present training programs.

The first is a general desire for a unified purpose in the training, coupled with unified standards and practices in the different training branches. Fundamentals are being stressed. Many institutions have adopted the uniform first year for engineering students in all their different departments. In this first year, engineering sciences, Physics, Chemistry, the Calculus, etc. are stressed, as they are considered the basic tools for engineers.

The second trend is indicated by the noticeable tendency of broadening the content of the engineering program in all branches. The importance of providing engineers with not only a solid technical background but a well rounded liberal education as well, has been recognized by the committee. The ideal engineering education would consist of the basic and advanced engineering studies blended with humanistic studies such as English, Economics, Sociology, etc.

These trends have led to a very successful program which is producing highly skilled, as well as well-rounded social engineers. Virtually every four-year engineering school, whether by conscious design or not, is developing into a liberal engineering institute and the quality of new engineers is reflecting this desirable trend.

This trend has, although, provided a dilemma for the educators. The question arises as to how an engineering candidate can be oriented into society and also trained in his highly technical field in the traditional four-year college program. This question is the basis for the arguments supporting the five-year and pre-engineering programs that have been considered and initiated at many universities and colleges.

Another solution to the problem has been proven in the engineering firms outside the walls of the schools. Many corporations now utilize an on-the-job training program to augment the classroom knowledge obtained by their new engineers.

In many engineering fields, graduate study is recommended for the filling-out of the basic education. This is particularly evident in the number of post-graduate degree holders in the fields of research and development. The field of Metallurgical Engineering is another excellent example of the need for graduate study. New knowledge and techniques are being developed rapidly, and further study is essential for the continuance of this development.

In a study of the future demands for engineers the committee has determined that the demand for engineers, which has been growing steadily since World War II, will accelerate to staggering proportions in the next few decades. It was recommended, in light of these findings, that the opportunity for engineering education be greatly expanded both in existing institutions and in the new

EDUCATION

Ric Barton is a senior working toward his B.M.E. He is an active participant in campus activities dividing his time between athletics and societies. Ric was a member of the varsity football team and continues to show his physical prowess in the intramurals. He is also a member of S.A.E., Sigma Tau, and A.S.M.E. Ric hopes to continue his education on the graduate level in the field of Aeronautical Engineering.

institutions arising throughout the country.

With this increasing demand for engineers, a reevaluation of the previously mentioned trend of breadth in the engineering program is in order. It is generally agreed that this trend will not be reversed but, in fact, concentrated on. The engineer of the future will have to be cognizant of the influence his technology will have on the social and economic forces in our society.

The ASEE is sponsoring a study, armed with a grant from the Carnegie Foundation, in which the focus will be "on goals for the humanities and social sciences that are relevant to the changing character of society and the changing role of the engineer."

It is apparent that this breadth in engineering education must not be achieved at the expense of the specialized technical training. The specialized training will become more and more important in the future and the sacrifice of the excellence in engineering training would be disastrous and should be avoided at all costs. The importance of the balance will be stressed and the improvements will have to be initiated carefully.

The obvious direction indicated by this argument is the increasing demand for graduate studies. Many institutions already require post-graduate study and there is every indication that the engineering firms will be looking for engineers who have studied beyond their baccalaureate programs.

Pressure is being exerted by practicing engineers to make graduate study a requirement for professional attainment. It is indeed possible that in the forseeable future the master's degree will be considered the basic professional degree in engineering.

For this situation to be obtained, provisions will have to be made for both the adequacy of the basic curriculum and the availability of post-graduate study. This end will be met according to the regional demands for engineers of higher technical skills. In some sections of the country basic engineering will be stressed, thus necessitating the emergence of new and larger graduate level schools. Established institutions will bolster their graduate programs and maintain their undergraduate schools for the development of the liberally educated engineers. The committee recommends experimentation by educators to find the best balance.

The balance that is sought by the ASEE wil enable the student to develop at a comfortable rate. His primary objective is of course his mastery of the technical skills necessary for his engineering work. Throughout his baccalaureate studies he would be subjected to a well-rounded liberal education and a solid foundation in the basic engineering sciences would be achieved. His preparation for graduate study, and his entry into society, would be accomplished in his basic four year undergraduate studies.

The basis for accreditation is a valuable tool for the improvement of engineering education. The accreditation process encourages innovation and at the same time maintains high standards of quality. At present there is no clear need for accreditation on the graduate level. The committee recommends a postponement of a program of accreditation at this level.

The primary basis for accreditation would be the degree of attainment of the goals set by the institution and the ASEE. The accreditation could, of course, be applied to the school itself, or each of the specific programs offered (i.e. E.E., M.E., C.E., etc.).

With the emphasis slowly shifting to graduate level studies, it is no surprise to observe that in the last couple of years graduate level enrollment has increased faster than undergraduate enrollment. Another interesting forecast by the committee is that by 1978 about one engineer in seven will go on to a doctorate.

Many schools may initiate a program incorporating the master's degree into the basic curriculum. This program would consist of a five-year program terminating with a combined bachelor's and master's degree in specialized fields of study.

A significant finding of the Goals Committee is that engineers with advanced degrees are *not* concentrated in research and teaching. They are, in fact, distributed throughout the engineering field and are engaged in every form of engineering work. With this fact in mind, the need for broadened opportunity in the advanced study programs is clearly present.

There was found to be a lack of experimental programs on the Doctoral level, and it was generally agreed that this was a serious deficiency. Engineering work entails a great deal of experimental and group work and the committee recommended that programs should be initiated in this important field.

Obviously, the most important factor assuring the success of any engineering education program is the students themselves. Of near equal importance is the faculty associated with the students. The faculty must be able to instill in the student the imspiration that is so important in a technological field such as engineering. The instructor must, of course, be technically competent in

Continued on page 31

"ENGINEERS WEEK

The School of Engineering and Applied Science, in conjunction with the George Washington University Hospital, held an Open House February 19-24, emphasizing the theme "Engineering . . . Design for World Health." The significance of the problem of world health is underscored in a letter about the Open House by President Lloyd H. Elliott who said in part:

> "The atmosphere of involvement and commitment at George Washington is reflected in its School of Engineering and Applied Science. Leadership in engineering education is its keynote; its objective, to relate science and technology to the problems of society, industry and the government."

The Open House was held during National Engineers' Week in which the general public was invited to attend and observe engineering and its influence on world health.

The Open House served to acquaint the general public and especially local high school students to the School of Engineering and the engineering profession at large. A significant problem confronting our society today relates to the need of establishing a rapport between engineers and the general public as was pointed out by President Lyndon B. Johnson:

> "Today, we take for granted that skilled engineering can routinely assure us of safe urban water supplies and efficient sanitation systems. We give little thought to our dependence on engineers to safeguard our public health.
>
> But there are new challenges to this generation of engineers. We must turn the best of our technology to preserving the health of our environment. New instruments that enormously improve diagnosis and treatment have given us a dramatic new vision of what engineers and doctors can accomplish when they work and think together on human medical problems.
>
> National Engineers Week offers young people across the country a sense of the urgency and excitement to be found in this work."

If tomorrow is here, what's in the future?

OPEN HOUSE"

Thus, it is important to attempt to provide information pertaining to the role of the engineer in society. Because of a recent nationwide decline in undergraduate engineering enrollment, it is even more important to portray to society the various aspects of the engineering profession.

In the last four days of National Engineers' Week, the general public and area high school students were invited to view the exhibits from thirty-five government agencies, private companies, and professional societies. For example, the Federal Aviation Agency sent an exhibit showing the air traffic control and radio navigational system while the Budd Company had a model of the future high speed train running between New York and Washington. The Naval Research Laboratory had an exhibit depicting the effects of hypervelocity projectiles on metal targets. Harry Diamond Laboratory brought an exhibit of the Army volume cycle respirator which uses fluidic controls to eliminate some moving parts.

Undergraduate engineering students gave guided tours of Tompkins Hall to more than seven hundred visitors and high school students. They toured the exhibit areas on the first, second, and fourth floors as well as the electrical and engineering mechanics laboratories.

Engineering students demonstrated the various pieces of equipment in the materials testing laboratory. Concrete specimens were compressed to failure in a universal testing machine as an example of testing required for all concrete

It goes POP when it breaks.

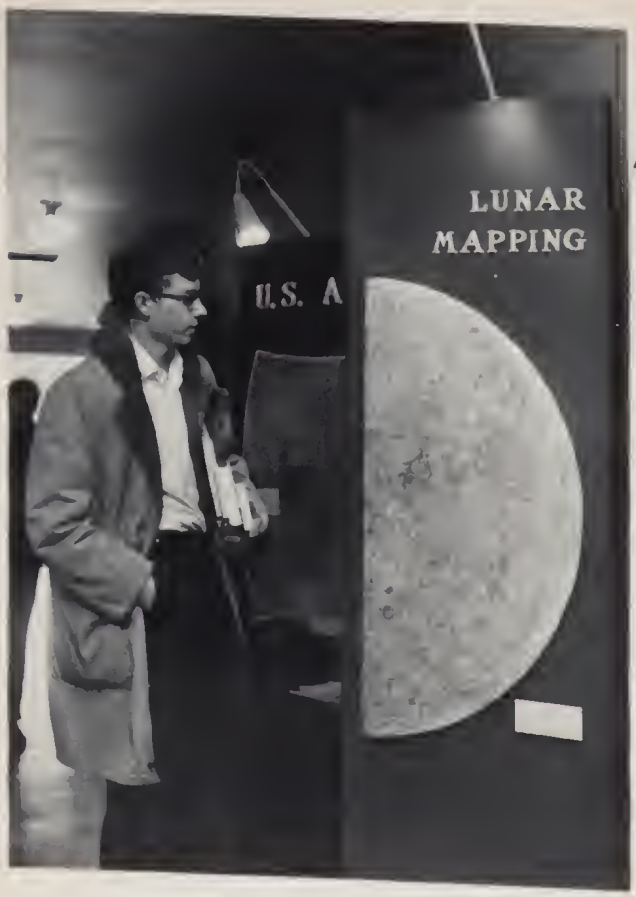
The hypervelocity research exhibit from Naval Research Laboratory catches the attention of would-be engineers.

used in construction purposes. A Charpy Impact machine demonstrated the impact properties of materials. Other equipment on view included hardness testing machines, torsion testing machine and a Tinius Olsen UTM, which exhibited tensile testing of metal rods.

Students in the general mechanical engineering laboratory displayed a variety of equipment including an axial-flow fan, a gas fired heating and air conditioning unit, and a steam turbine. Also, a low speed wind tunnel was exhibited in which direct measurements of lift and drag forces were made on an airplane wing. A shock tube, which demonstrated the formation and propagation of a pressure shock wave, was also displayed.

Several closed circuit TV units monitored the electrical engineering laboratory. Visitors were challenged by a Minivac computer to play tic-tac-toe and were also fascinated by the many variations in Lissajous figures. Jacob's ladder, a familiar sight in science-fiction movies, produced its crackling discharges. Several examples of audio and microwave transmission equipment were offered for the visitors' inspection.

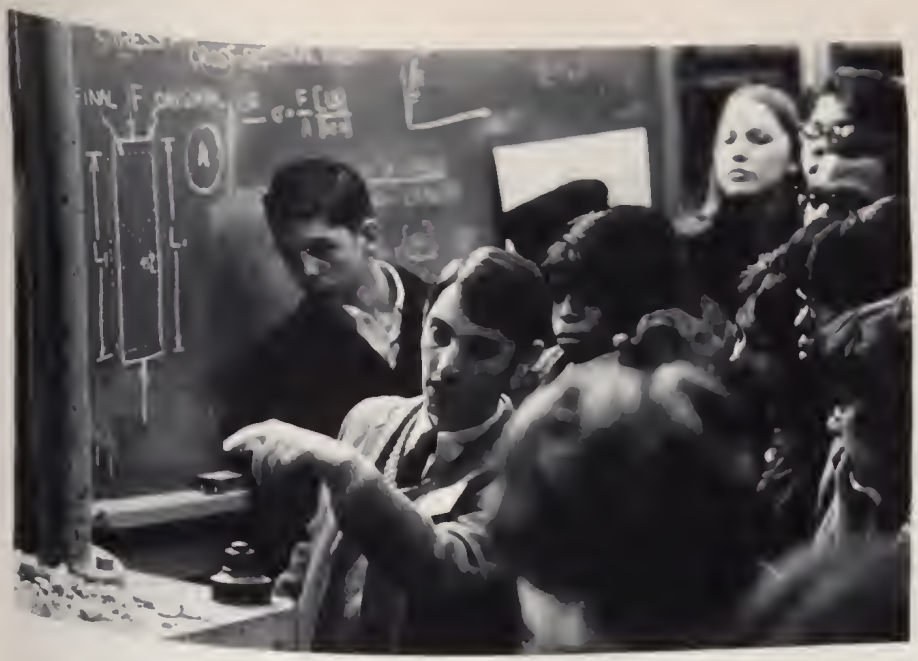
Members of the Engineer Alumni Association actively participated by editing a special Open House magazine and acting as greeters to the visitors. Finally, many students and faculty contributed significantly to making Engineers' Week Open House 1968 a success.



A nice place for a vacation.

. . . And this one is for room service.

Look, don't ask questions.



Joel Marenberg explains the mechanics of compression.

A look into the future.

Closed circuit TV reveals ALL.

Good old Osbert. We like his style.

And you, too, ought to be thinking *career*. Read our booklet, "Careers with Bethlehem Steel and the Loop Course." It's one of the few books on your required reading list that you won't have to pay for. You can pick up a copy at your placement office, or get one by writing to Manager of Personnel, Bethlehem Steel Corporation, Bethlehem, Pa. 18016.

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CAMPUS NEWS

ENGINEERS' BALL — 1968

The annual Engineers' Ball was held on Saturday, February 17 at the Phi Sigma Kappa house. Even though the turn out was rather poor, those that did attend had an enjoyable time dancing to the sometimes overpowering music of the Vanguards and drinking cold free beer. Highlight of the evening was the crowning of the Engineers' Queen, Miss Susanne Gregory.

Miss Gregory is a senior sociology major from Reading, Connecticut. Aside from her studies she finds time for stamp collecting, reading, and the more rigorous activities of fencing, tennis, and swimming. She has also worked on the hill for Congressman Belts of Ohio.

Our heartiest congratulations to Susanne.

Engineers' Queen—Susanne Gregory

HONORS LIST — FALL SEMESTER 1967

Edward H. Abraham
Peter M. Austin
Jacob M. Azrael
James B. Bladen
Richard J. Blumberg
Jerrold L. Bonn
Joseph E. Castle
John T. Cavanaugh
Michael S. Cook
John C. Davies III
Kenneth G. Foote
Joseph D. Fretz II
Jan E. Friedlander
Paul M. Haldeman, Jr.
David L. Huff
Robert J. Keltie
Ronald F. Kopeck
Harry A. Kuhn, Jr.
John P. Liebesny
Crawford X. Lopez
Arthur W. Lucas, Jr.
Sandy J. Marenberg
Steven T. Momii
Martin J. Myers
William T. Packard
Michael W. Rohrer
Myron A. Schloss
Christopher G. Soares
Karen S. Spindel
Stuart H. Terl
Donald J. Vespia
Wesley A. Winchell

TECHNICAL JOB INTERVIEWS

(at Placement Office)

Mar. 11	Interstate Commerce Commission Defense Communications Agency
Mar. 12	Applied Physics Lab Supervisor of Shipbuilding, Conversion, Repair—USN
Mar. 13	Delaval Turbine, Inc. Allegheny Ludlum Steel Corp.
Mar. 14	Washington Gas Light Co.
Mar. 15	D. C. Dept. of Highways & Traffic Melpar Veterans Administration
Mar. 18	Dept. of Public Works, Anne Arundel County, Maryland
Mar. 19	D. C. Health Dept.
Mar. 25	General Research Corp.
Mar. 26	Stauffer Chemical
Mar. 27	H.R.8. Singer Co.

defending their country against foreign invasions, not to mention the millions of people, both South and North Vietnamese, who have little interest in political ideology and only want to be left alone.

Indeed, if you consider yourself "ill informed, at best", obey the first command of a good engineer: Learn the facts before you speak.

/s/Peter H. Sawitz

To the Editor:

It is unfortunate that you have joined the long list of people who have grossly misused the word "passivism" to discredit the Anti-Vietnam War movement. Seizing upon the general unpopularity of the pacifist philosophy in this country, you have labeled all people opposed to our involvement in Vietnam as pacifists. While there is no doubt that all pacifists (people who are against war under any circumstances) are opposed to our fighting in Vietnam, I would submit to you that only a small percentage of the "doves" are pacifists. Certainly, the many men in the large "Veterans for Peace in Vietnam" movement, and the many well known military men who have spoken out against the war such as Generals Gavin, Ridgeway, Norstad, Shoup are not pacifists. Neither the New York Times nor Life magazine have been known for their pacifist views. Of the many congressmen opposed to the war, I have yet to hear one of them claim to be a pacifist. Mr. Editor, you don't have to be a pacifist to be opposed to our government's policy in Vietnam; all it takes is the realization that your country has made a tragic error and has become trapped into the position of saving Vietnam from communism by destroying Vietnam.

The attempt of your editorial to link the purposes and motives of the current anti-war movement with the America First Committee of pre World War II days shows a complete lack of understanding of the history which you claim to be examining. The America Firsters were isolationists who believed we should hide our heads and not get involved in world affairs. The current movement consists of people who hold the diametrically opposite viewpoint that it is essential for this country to be intimately involved in world affairs in order to *prevent war*. Our opposition is based on the belief that our government's current policy is not in the best interests of the Vietnamese people, the American people, or the entire human race for that matter. If any group deserves to be accused of a lack of perspective (as you put it), it is the United States government because its policy is based upon a very narrow, self-centered and distorted view of the world which insists that our way of life is the only acceptable way for other peoples. Our attitude is that we not let South Vietnam become a communist country because *we* don't think that communism is a good way of life for *them!!*

Your implication that Ho Chi Minh is another Hitler and that the threat to world peace posed by North Vietnam is similar to that posed by Nazi Germany is absurd. If, however, what you meant was that the real threat to peace today is China and not North Vietnam, I somehow don't feel as if that will be any consolation to the Vietnamese people (both North and South) whose country we are devastating in an effort to contain China. We have destroyed what could have been the best buffer against China in Southeast Asia — a strong, united, nationalist, independent, stable government in Vietnam under Ho Chi Minh.

The two reasons you gave as "sufficient justification for our presence there" show the absurdity of your logic. Your reasoning would lead you to accept the following argument (all but the underlined words are yours):

> "(1) it is beneficial to North Vietnam in particular and the communist cause in general for the U.S. to refrain from dropping a hydrogen bomb on Hanoi. (2) North Vietnam and the general communist movement are very probably backing the "don't drop a hydrogen bomb on Hanoi" activities. Those two points alone would seem to be sufficient justification for our dropping a hydrogen bomb there."

You suggest that since it is ill-informed, the public should simply follow the administration's lead. Well, at least you are admitting that the government has failed in its duty to inform the public. For months now, our Secretary of State has refused to testify in open hearings of the Senate Foreign Relations Committee. It is obvious that the administration has no wish to inform the public and is afraid of engaging in open debate with the elected representatives of the people. This administration has given rise to the expression "the credibility gap". In view of the several well known attempts of the administration to deliberately deceive the public on matters relating to the war, and particularly the recent rumors concerning the real circumstances surrounding the Gulf of Tonkin incident, I would agree with you that the public is ill-informed (wrongly-informed might be more accurate). It is suicidal for the public to remain complacent under these circumstances. It is imperative that we demand the truth from our government. The very foundations of our democracy depends upon it.

/s/Barry Hyman

TECH NEWS—Continued from page 14

The "crucibleless liquid metal gas extraction system" has been developed to:

1. Eliminate contamination of the metal sample by a crucible.
2. provide rapid — and multiple — sample heating and melting.
3. provide electromagnetic stirring of the sample and rapid gas extraction, and
4. confine high melting temperatures to the sample only.

The system consists of a quartz sample holder enclosed in an evacuated quartz tube which fits into an r-f levitation coil powered by a 5-kw, 450-kHz generator. As the metal sample is moved into the electromagnetic field of the coil it is levitated above the sample holder. At the same time it is rapidly melted and stirred so that it gives up any minute quantities of gas it contains. The extracted gas is then pumped to a mass spectrometer for analysis. With this system is possible to analyze samples in which the total volume of extracted gas was only 0.01 to 0.1 parts per million by weight.

Evacuated Quartz Tube for Electromagnetic Levitation System

INSTANT TRANSLATION OF VIETNAMESE DOCUMENTS

A system for immediately translating captured Viet Cong documents has been developed for use by the military. It consists of a model dictionary, programmed into about 1,000 discrete Vietnamese words and phrases, and an RCA Spectra 70/45 time-sharing computer. Data can be sent via communications lines or radio to the computer, permitting military officials to obtain immediate intelligence prior to sending captured documents to a central location for manual translation which is very tedious and time consuming. The computer enables linguists to translate foreign documents very quickly, because as much as 80 per cent of a translator's time is spent looking up words. With computerized dictionaries performing this function, the human translator is able to make more effective use of his time and improve his accuracy. The compute performs a word-for-word and, in some cases, phrase-for-phrase search in the Vietnamese—English dictionary stored in its memory and supplies the English equivalent of the input sentences. The system was developed by Computing Technology Inc., of Paramus, N.J.

ASEE—Continued from page 21

order to fulfill his obligation to the students, and to the engineering profession as a whole.

The committee recommended that the faculty be encouraged to take advantage of the educational opportunities provided by several of the large foundations. The requirement recommended by the ASEE for engineering educators is that they have completed their doctoral level work.

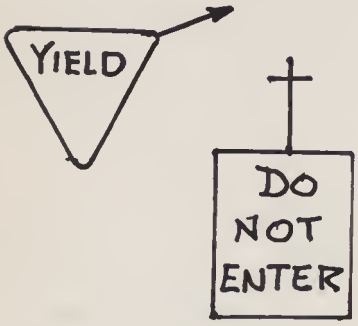
One of the most practical education tools, used in colleges, is the corporation research performed by students. The committee felt that this type of preparation was excellent and should be both encouraged and pursued by engineering school officials.

Along this line of corporation — school interaction is the program of advanced study, available at many schools and open to employees of nearby engineering firms. Recommendations along this line include improvement of existing systems, and arrangements for extension of advanced education to remote firms. This system would be highly practical, and would extend the opportunity to advance in technical skills to many more practicing engineers.

It is a strong recommendation of the committee that engineering schools make every effort to cooperate with the engineering industry, concentrating particularly on industries near the school. As mentioned before, the opportunities for education provided in the research given to engineering schools by the industries, is limitless. It also gives the student an invaluable look into the type of work he is likely to be doing. Both the industries and the schools profit from a well-organized program of coordinated research.

The final report of the Goals Study of the ASEE is incorporated, in full, in the January 1968 issue of *The Journal of Engineering Education*, published by the ASEE. It is a very worthwhile article for any engineering student interested in his future. It should serve as an enlightening factor to the student who is wondering about the merits of graduate school. This article, and the study itself, should serve as a very useful guideline for the development of future engineering education.

THE SHAFT



Precocious little Johnny was asked by the teacher to go to the board and do some arithmetic problems for the rest of the class. Upon arriving at the board the teacher asked him to first add two and two, and then multiply three times three. After doing these two operations correctly the teacher commented, "That's pretty good Johnny."

To which he replied, "Pretty good, hell that's perfect."

* * *

After attending a party and having too much to drink the E.E. was driving home. While doing this, somehow he managed to drive down a one way street the wrong way. As luck will have it, he was promptly stopped by a policeman who asked, "Hey, kid didn't you see the arrow back there?" To which the reply was "Heck no, I didn't even see the Indians."

* * *

An E.E. was in the news the other day for having a heart transplant. However, the operation was a failure — the heart rejected the body.

A priest and a rabbi were sitting next to each other on a plane one day. After talking for a while the priest said, "I know that you're not supposed to eat pork, but just between us, have you ever tried it?"

To this the rabbi reluctantly replied, "Just between us, yes, I tried it once."

After a moment of silence the rabbi inquired, "I know that as a priest you're supposed to be celibate, but between us, have you ever made mad passionate love with a girl?"

The priest embarrassed answered, "Yes, I have, just once."

To this the rabbi quipped, "Beats pork doesn't it."

* * *

It was brought to our attention that the inventor of the mini skirt was Seymor Hinny.

* * *

Seymor also suggested that the correct thing to wear under a mini skirt is a Freudian slip.

* * *

Elderly E.E. to a beautiful prostitute, "My wife says I'm a great lover. But I'd like to get a professional opinion."

* * *

"The trouble with Harold," commented the svelte model to her roommate, "is that once he starts kissing you, he never knows where to stop."

"That's funny," countered her friend. "The last time I went out with him, he found a great place."

* * *

Daughter to parents, "Guess I'm just an old-fashioned gal, but I want to ask your blessing before I move into Bernie's pad."

* * *

A recent station break in Israel went thusly: "This is Radio Tel Aviv, 1500 on your AM dial, but for you 1498."

* * *

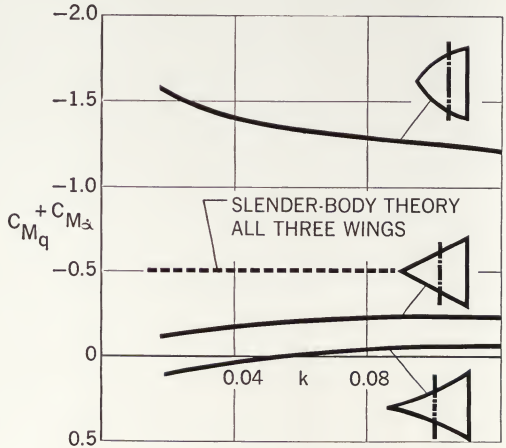
Two cannibals were chatting over lunch. One said, "You know, I just can't stand my mother-in-law."

"Forget about her," the other replied, "just eat the noodles!"

SIGNS OF THE TIMES:

Taken from the American University's student newspaper, "For sale: one white maternity dress, size 8. Never used, false alarm. Call Betty, 2446800, after curfew."

Study transonic flow and make good grades.



Like Captain.

Take a look at any campus. Big. Small. Rural. Urban. You see the same thing: guys and gals. Same books. Same looks. Same hopes.

And you are there.

Some students really jam in every bit of opportunity they can grab hold of. Some just drift through.

Which are you?

Here's a good tip: If you join the Air Force ROTC program on your campus you'll know you're grabbing a big opportunity. Financial assistance is available. You'll graduate as an officer—a leader on the Aerospace Team. You have executive responsibility right where it's happening. Where the space-age breakthroughs are. You'll be able to specialize in the forefront of modern science and technology—anything from missile electronics to avionics. You can also be a pilot. You won't get lost in some obscure job with no future.

You'll also enjoy promotions and travel.

So graduate with our blessings.

And a commission.

UNITED STATES AIR FORCE
ROTC (A.U.) BLDG. 500 (ARTOI)
Maxwell AFB, Alabama 36112
Interested in Flying ☐ Yes ☐ No

NAME AGE

COLLEGE

MAJOR SUBJECTS

CAREER INTERESTS

HOME ADDRESS

CITY STATE ZIP

EC-82

Dan Johnson has a flair for making things.

Just ask a certain family in Marrakeck, Morocco.

A solar cooker he helped develop is now making life a little easier for them—in an area where electricity is practically unheard of.

The project was part of Dan's work with VITA (Volunteers for International Technical Assistance) which he helped found.

Dan's ideas have not always been so practical. Like the candlepowered boat he built at age 10.

But when Dan graduated as an electrical engineer from Cornell in 1955, it wasn't the future of candlepowered boats that brought him to General Electric. It was the variety of opportunity. He saw opportunities in more than 130 "small businesses" that make up General Electric. Together they make more than 200,000 different products.

At GE, Dan is working on the design for a remote control system for gas turbine powerplants. Some day it may enable his Moroccan friends to scrap their solar cooker.

Like Dan Johnson, you'll find opportunities at General Electric in R&D, design, production and technical marketing that match your qualifications and interests. Talk to our man when he visits your campus. Or write for career information to: General Electric Company, Room 801Z, 570 Lexington Avenue, New York, N. Y. 10022

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GENERAL ELECTRIC

AN EQUAL OPPORTUNITY EMPLOYER (M/F)

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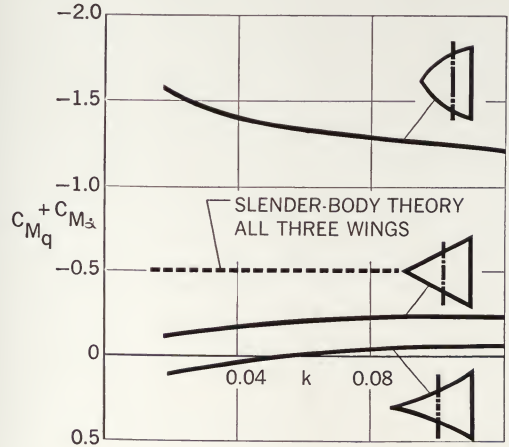

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